

2. Subbasin Assessment – Water Quality Concerns and Status

This section of the assessment contains the following information:

1. water bodies listed as water quality limited
2. water quality standards that are applicable to the subbasin
3. designated and existing beneficial uses
4. summary of existing water quality data
5. data gaps identified during development of the assessment

2.1 Water Quality Limited Segments Identified in the Subbasin

The South Fork Payette River contains one segment that is listed on the 1998 §303(d) list as not fully supporting beneficial uses (Table 5). This segment is the South Fork of the Payette River from the wilderness boundary (latitude 44.140194° N and longitude 115.148994° W) to the confluence with the Payette River (Figure 15). Additionally, four other water bodies were identified as not supporting beneficial uses, but these are not identified on the 1998 §303(d) list. The status of the beneficial uses was determined by Beneficial Use Reconnaissance Program (BURP) data collected in 1997. These water bodies are identified in Table 5 and in Figure 15.

Section 303(d) of the CWA states that waters that are unable to support their beneficial uses and that do not meet water quality standards must be listed as water quality limited waters. Subsequently, these waters are required to have TMDLs developed to bring them into compliance with water quality standards.

Table 5. Water Quality Limited Segments in the South Fork Payette River subbasin.

Water Body Name	Assessment Unit ID Number	1998 §303(d)¹ Boundaries	Pollutants	Listing Basis
South Fork Payette River	5186 SW001_05	Wilderness Boundary to Payette River	sediment	Boise National Forest Plan
Wash Creek	SW001_02	Headwaters to SF Payette River	unknown	Not listed BURP Data
Smokey Creek	SW001_02	Headwaters to SF Payette River	unknown	Not listed BURP Data
Horn Creek	SW001_02	Headwaters to SF Payette River	unknown	Not listed BURP Data
Chapman Creek	SW001_02	Headwaters to SF Payette River	unknown	Not listed BURP Data

¹Refers to a list created in 1998 of water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303 (d) of the Clean Water Act.

2.2 Applicable Water Quality Standards

The water quality standards for the state of Idaho are legally enforceable rules that consist of water use designations, numeric or narrative criteria established to protect the water uses, and an anti-degradation policy. The water quality criteria include narrative or “free from” criteria applicable to all waters of the state (IDAPA 58.01.02.200) and numeric criteria, which vary according to water use (IDAPA 58.01.02.250, 251, and 252). Typical numeric criteria include bacteriological criteria for recreational uses, physical and chemical criteria for aquatic life uses (e.g. pH, temperature, dissolved oxygen, ammonia, toxins, etc.), and turbidity and toxics criteria for water supply uses. The water quality standards for Idaho are published in the state’s rules at IDAPA 58.01.02 and are officially titled *Water Quality Standards and Wastewater Treatment Requirements*.

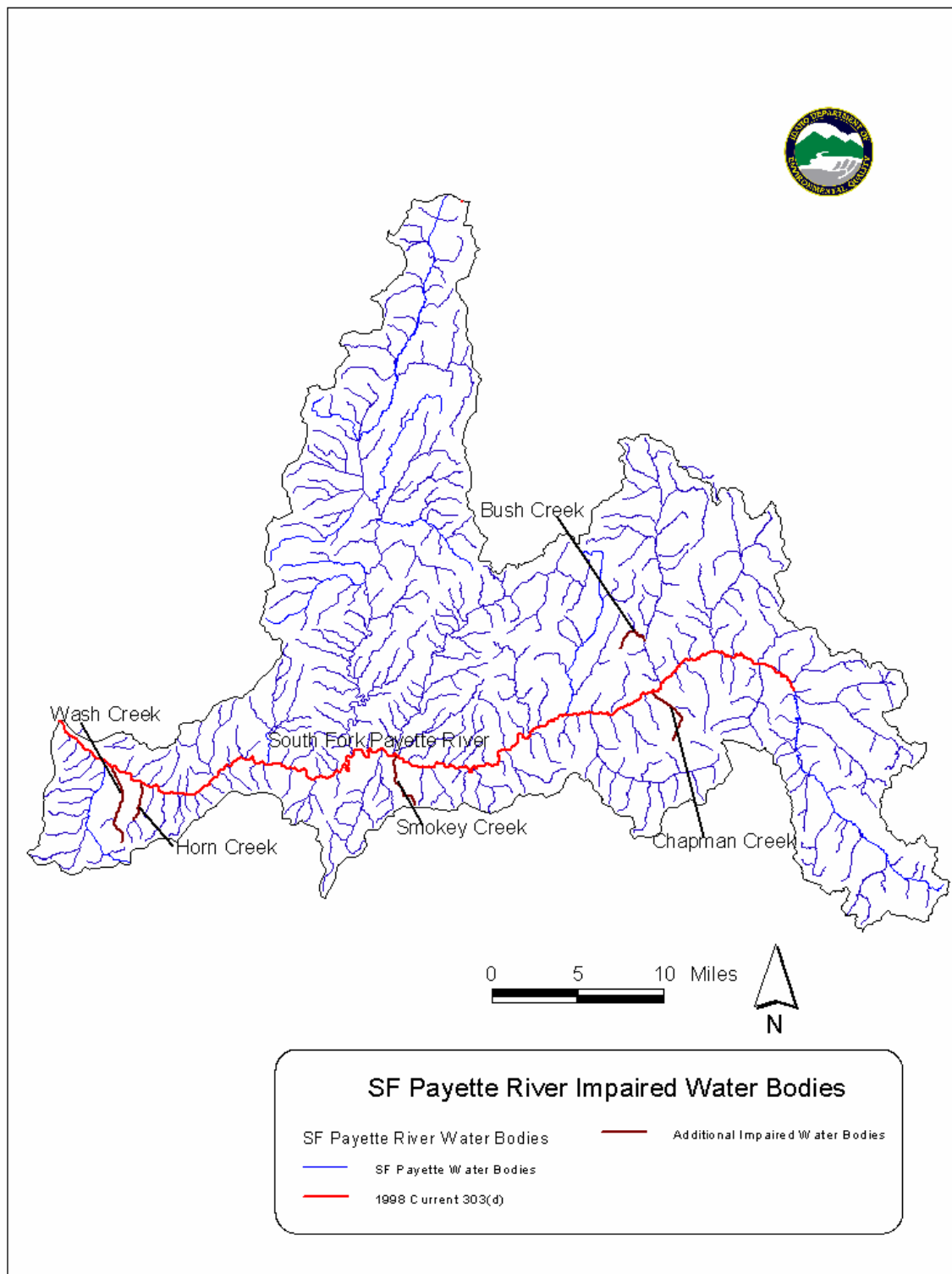


Figure 15. Water Quality Limited Segments within the South Fork Payette River Subbasin.

Beneficial Uses

Idaho water quality standards require that surface waters of the state be protected for beneficial uses, wherever attainable (IDAPA 58.01.02.050.02). These beneficial uses are interpreted as existing uses, designated uses, and presumed uses as briefly described in the following paragraphs. The *Water Body Assessment Guidance*, second edition (Grafe et al. 2002) gives a more detailed description of beneficial use identification for use assessment purposes.

Existing Uses

Existing uses under the CWA are “those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards.” The existing in-stream water uses and the level of water quality necessary to protect the uses shall be maintained and protected (IDAPA 58.01.02.050.02, .02.051.01, and .02.053). Existing uses include uses actually occurring, whether or not the level of quality to fully support the uses exists. A practical application of this concept would be to apply the existing use of salmonid spawning to a stream that could support salmonid spawning, but salmonid spawning is not occurring due to other factors, such as dams blocking migration.

Designated Uses

Designated uses under the CWA are “those uses specified in water quality standards for each water body or segment, whether or not they are being attained.” Designated uses are simply uses officially recognized by the state. In Idaho these include uses such as aquatic life support, recreation in and on the water, domestic water supply, and agricultural uses. Water quality must be sufficiently maintained to meet the most sensitive use. Designated uses may be added or removed using specific procedures provided for in state law, but the effect must not be to preclude protection of an existing higher quality use such as cold water aquatic life or salmonid spawning. Designated uses are specifically listed for water bodies in Idaho in tables in the Idaho water quality standards (see IDAPA 58.01.02.003.27 and .02.109-.02.160 in addition to citations for existing uses).

Table 6. South Fork Payette River subbasin designated beneficial uses.

Water Body (WBID)	Designated Uses ¹	1998 §303(d) List ²
South Fork Payette River (1, 5)	CW, SS, PCR, DWS, SRW	X
Deadwood River (14, 19)	CW, SS, PCR, DWS, SRW	
Deadwood Reservoir (18)	CW, SS, PCR, DWS, SRW	

¹CW – Cold Water, SS – Salmonid Spawning, PCR – Primary Contact Recreation, SCR – Secondary Contact Recreation, AWS – Agricultural Water Supply, DWS – Domestic Water Supply

²Refers to a list created in 1998 of water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303 (d) of the Clean Water Act.

Presumed Uses

In Idaho, most water bodies listed in the tables of designated uses in the water quality standards do not yet have specific use designations. These undesignated uses are to be designated. In the interim, and absent information on existing uses, DEQ presumes that most waters in the state will support cold water aquatic life and either primary or secondary contact recreation (IDAPA 58.01.02.101.01). To protect these so-called “presumed uses,” DEQ will apply the numeric cold water criteria and primary or secondary contact recreation criteria to undesignated waters. If in addition to these presumed uses, an additional existing use, (e.g., salmonid spawning) exists, because of the requirement to protect levels of water quality for existing uses, then the additional numeric criteria for salmonid spawning would additionally apply (e.g., intergravel dissolved oxygen, temperature). However, if for example, cold water aquatic life is not found to be an existing use, an use designation to that effect is needed before some other aquatic life criteria (such as seasonal cold) can be applied in lieu of cold water criteria (IDAPA 58.01.02.101.01).

Table 7. South Fork Payette River subbasin existing beneficial uses.

Water Body	Existing/Presumed Uses¹
Rock Creek	CW, SS, SCR
Tenmile Creek	CW, SCR
Wapiti Creek	CW, SS, SCR
Canyon Creek	CW, SS, SCR
Warm Spring Creek	CW, SS, SCR
Eightmile Creek	CW, SS, SCR
Fivemile Creek	CW, SS, SCR
Clear Creek	CW, SS, SCR
Whitehawk Creek	CW, SCR
Wilson Creek	CW, SCR
Scott Creek	CW, SS, SCR
Big Pine Creek	CW, SS, SCR
Smokey Creek ³	CW, SS, SCR
Horn Creek ³	CW, SS, SCR
Chapman Creek ³	CW, SS, SCR
Wash Creek ³	CW, SS, SCR
Bush Creek ³	CW, SS, SCR

¹CW – Cold Water, SS – Salmonid Spawning, SCR – Secondary Contact Recreation ²Refers to a list created in 1998 of water bodies in Idaho that did not fully support at least one beneficial use. This list is required under section 303 (d) of the Clean Water Act. ³Water Bodies not on 1998 303(d) list

Pollutant Relationships to Uses – Target Identification

Both suspended and bedload sediment (sediment particles too large or heavy to be suspended, but still transported by flowing water) can have negative effects on aquatic life communities. Many fish and aquatic insect species can tolerate elevated suspended sediment levels for short periods of time, such as during natural spring runoff, but longer durations of exposure are detrimental. Elevated suspended sediment levels can interfere with fish feeding behavior (difficulty finding food due to visual impairment), damage gills, reduce growth rates, smother eggs and fry in the substrate, damage habitat, and in extreme cases eventually lead to death. Eggs, fry, and juveniles are especially sensitive to suspended sediment.

Newcombe and Jensen (1996) reported the effects of suspended sediment on fish, summarizing 80 published reports on suspended sediments in streams and estuaries. For rainbow trout, physiological stress, which includes reduced feeding rate, is evident at concentrations of 50 to 100 mg/L suspended sediment concentrations (SSC) when those concentrations are maintained for 14 to 60 days. Similar effects are observed for other species, although the data set is less reliable. Adverse effects on habitat, especially spawning and rearing habitat, were noted at similar concentrations. Using the Newcombe and Jensen work as a reference, Miller (1998) developed suspended sediment water column targets for the protection of salmonid spawning. These targets are also protective of cold water aquatic life in general. The targets developed by Miller (1998) are ***a geometric mean of 50 mg/L SSC for no longer than 60 days and a geometric mean of 80 mg/L SSC for no longer than 14 days. These targets will be applied to the South Fork Payette River to assess water column sediment levels as it relates to aquatic life beneficial use support status.*** The two-tiered durational nature of the targets allows for the acute slugs of elevated sediment often associated with short-term precipitation events.

Bedload sediment also adversely affects aquatic species, although the direct effects of bedload are difficult to gauge because bedload is largely a function of stream power, which is in most cases not a manageable condition. As sand and silt wash downstream, they can cover spawning gravels, increasing embeddedness in the streambed. If this occurs during incubation periods or while small fry are using the spawning gravels to develop, it may eliminate those areas and result in death. Bedload can also reduce intergravel DO levels by decreasing the critical re-oxygenating flow through the intergravel matrix. Unlike the nearby Middle Fork Payette River, the South Fork Payette River does not indicate impairment due to sediment, suspended or bedload. Due to the river's gradient, the South Fork Payette River is typified by high point velocities. This can be illustrated by evaluating the sediment transporting capability of the South Fork Payette River through an examination of the water velocities recorded at the U. S. Geological stream gage at Lowman. Between May 26, 1941 and April 21, 2003, 587 discharge measurements were collected. Stream velocity ranged between 0.84 feet per second (0.57 miles per hour) to 9.0 feet per second (6.14 miles per hour) with an average velocity of 3.05 feet per second (2.07 miles per hour). Hunt (1974) reported that sediment up to thumb-sized (gravel) could be transported in stream velocities as little as 2 miles per hour. With a 62-year average stream velocity over 2.07 miles per hour, the South Fork Payette River easily transports fine-grained sediment. Furthermore, it is unlikely that investigators would be able to detect reductions of fine-grained sediment in the

South Fork Payette River resulting from management changes and TMDL mandated sediment reduction treatments. By comparison, the Middle Fork Payette River near Lightning Creek is typified by point velocities of near .40 feet per second (.30 miles per hour). As such, sediment deposition in the Middle Fork Payette River readily occurs and is readily quantifiable. Thus, a TMDL was prepared in 1998 (DEQ 1998).

As mentioned above, bedload is largely a function of stream power, which is driven by stream velocity. In smaller order water bodies, higher velocities are short duration events based on snow melt or storm events. Directly related to the size of the watershed, peaks in the hydrographs and base flow conditions can occur within a week of each other in smaller watersheds, with peak flows occur during a few days. While in the larger watersheds, peak flows and baseline flows may occur months apart, with peak flows lasting for weeks.

These short duration high velocity flows may not offer the opportunity for complete removal of either the larger sediment particles or the smaller particles which may have entered the water body due to land use practice and/or natural erosion. The other consideration is the presence of fish that prefer slower velocities for refugia and spawning activity. Cold water species such as trout prefer smaller tributaries for spawning, incubation and fry development, with rearing occurring in the larger water bodies.

Many studies have been conducted to determine the affects of sediments, both bedload and suspended, on cold water species. Suspended sediments or suspended solids usually affect sight-feeding capability, clogging of gills or related stress as mentioned above. Bedload sediment, especially fine sediment of less than 6 millimeters (mm) in diameter, can cause impairment of uses in a variety of ways. Bedload sediment can fill in gravels associated with salmonid spawning gravels, cover redds reducing intergravel dissolved oxygen levels, encase fry, fill in interstitial spaces required for fry development and salmonid food sources, reduce pool volume required for salmonid refugia areas, and cover substrate required for primary food (periphyton) production areas.

Surface fines can impair benthic species and fisheries by limiting the interstitial space for protection and suitable substrate for nest or redd construction. Certain primary food sources for fish (Ephemeroptera, Plecoptera, and Tricoptera species [EPT]) respond positively to a gravel to cobble substrate (Waters 1995). Substrate surface fine targets are difficult to establish. However, as described by Relyea, Minshall, and Danehy (2000), macroinvertebrate (Plecoptera) intolerant to sediment are mostly found where substrate fines (<6mm) is less than 30%. More sediment tolerant macroinvertebrates are found where the substrate cover (<6mm) is greater than 30%

Most studies have focused on smaller streams, A, B, and C channel types (Rosgen 1996). Studies conducted on Rock Creek (Twin Falls County, Idaho) and Bear Valley Creek (Valley County, Idaho) found percent fines above 30% begin to impair embryo survival (Idaho DEQ 1990). Overton et al. (1995) found natural accumulation of percent fines were about 34% in C channel types. Most C channel types exhibit similar gradient as F channel types, <2.0% (Rosgen 1996).

2.3 Summary and Analysis of Existing Water Quality Data

Water quality and biological data from the Boise National Forest, USGS and the DEQ are summarized in this section. This summary focuses on available parameters pertinent to fine-grained sediment, the pollutant of concern in the listed segment.

South Fork Payette River

The USGS has monitored surface water quantity and quality over an extended period of time in the South Fork Payette River. Table 8 shows the location of each station and the period of record for which data exists.

Table 8. USGS surface water quality and quantity monitoring locations in the South Fork Payette River Subbasin.

Site No.	Water Body	Location	Events	First	Last
13235000	SF Payette River	At Lowman	299	01-Mar-42	24-Sep-02
13237500	SF Payette River	At Garden Valley	11498	15-May-21	30-Sep-60

Flow Data

Since 1942 the USGS has collected daily flow data from the South Fork Payette River at Lowman. These data provide valuable insight into the annual hydrograph for the listed segment of the river. Figure 16 shows the annual average flow at Lowman for each year since 1942. Also shown on the figure is the average flow for the period of record. This value is 861 cfs. The year 2002 is not included in this figure because data for the entire year are not yet available. The data show that the average annual flow in the river can remain relatively static for years at a time or can fluctuate dramatically from one year to the next. This relative infrequency in flow consistency makes the determination of a “typical” flow year difficult. Therefore, the average flow for the period of record is considered a typical flow for purposes of this subbasin assessment.

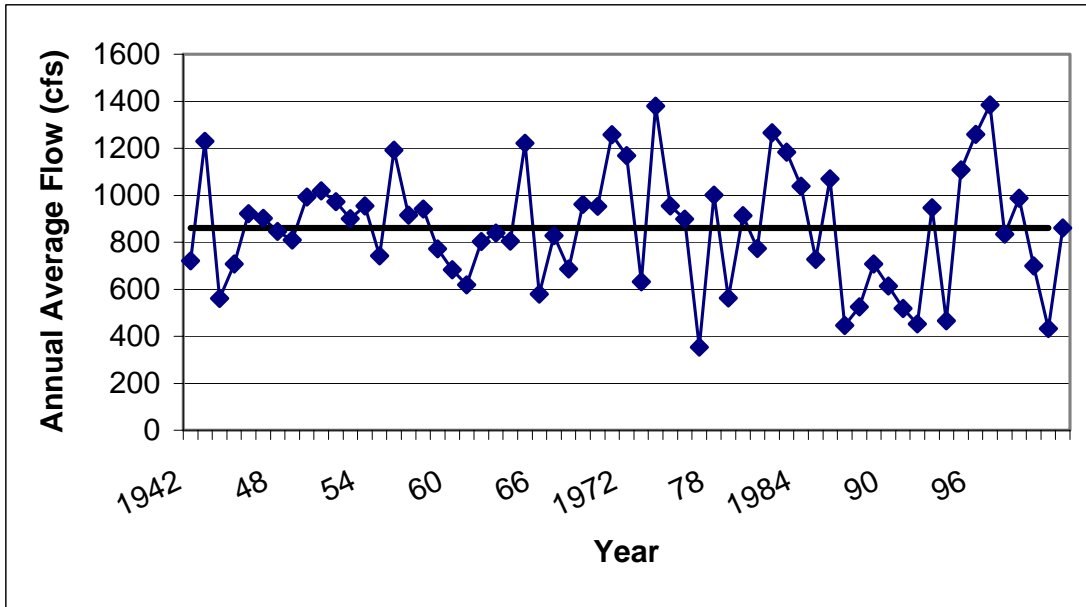


Figure 16. Annual Average Discharge at Lowman, Idaho since 1942 as Compared to Period of Record Average Discharge of 861 cfs.

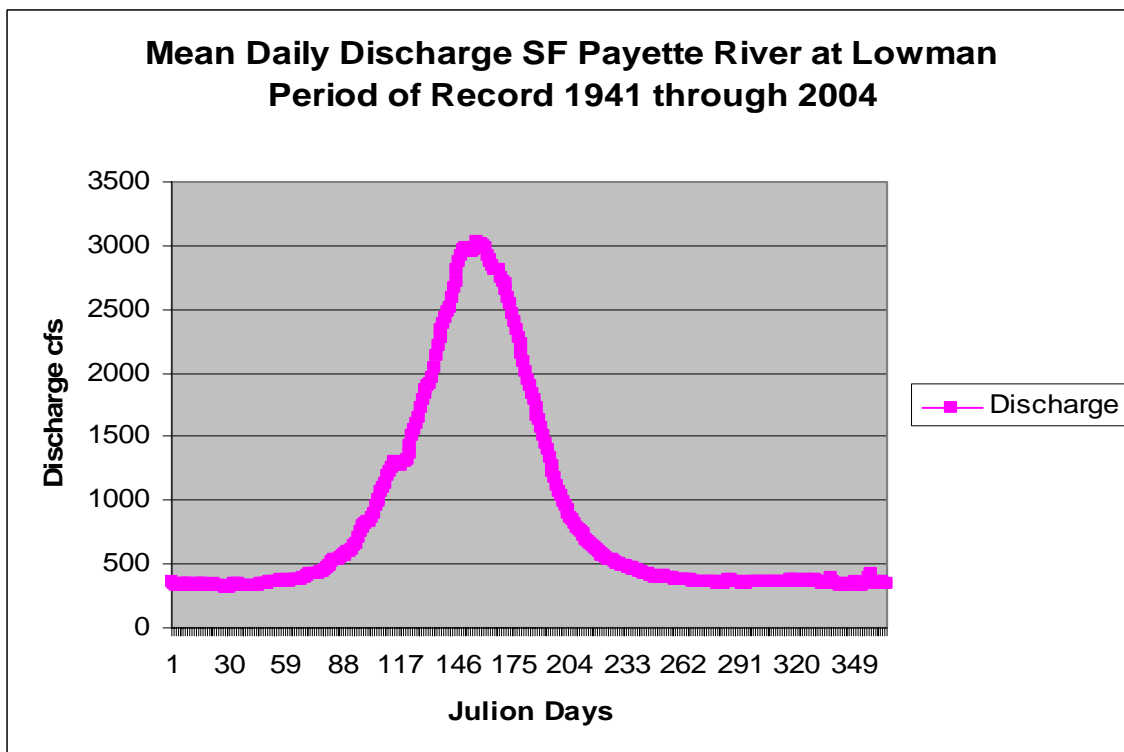


Figure 17. Mean Daily Discharge SF Payette River at Lowman, 1941 through 2004

Water Column Data – Suspended Sediment Concentration (SSC)

The South Fork Payette River at Lowman site is the only surface water quality station for which sufficient amounts of suspended sediment data are available. Data are primarily available during the late spring and early summer (April –June) for the years 1994 and 1995. Additional data are available in the years 1992, 1998 and 2001, but the data are far less robust. Investigators completed analyses for 85 parameters at various times during the period of record from this station. Out of these parameters, discharge (parameter code 00061) and suspended sediment concentration (parameter code 80154) best apply to an assessment of fine-grained sediment, the pollutant of concern in the South Fork Payette River.

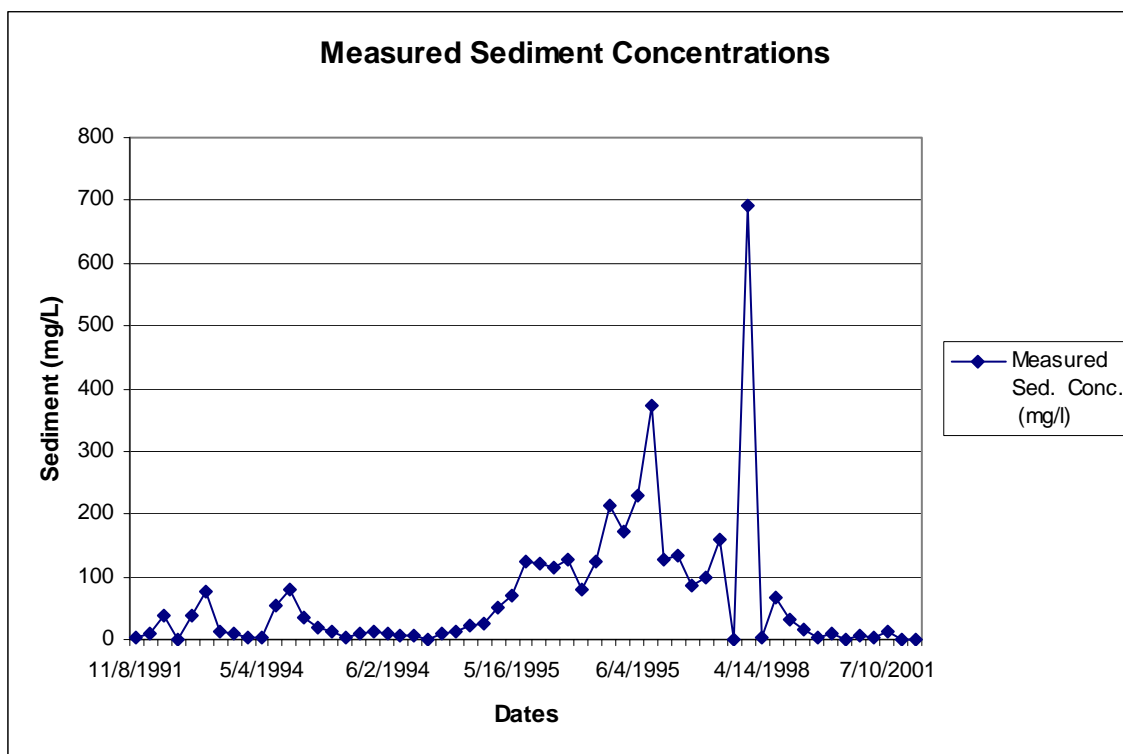


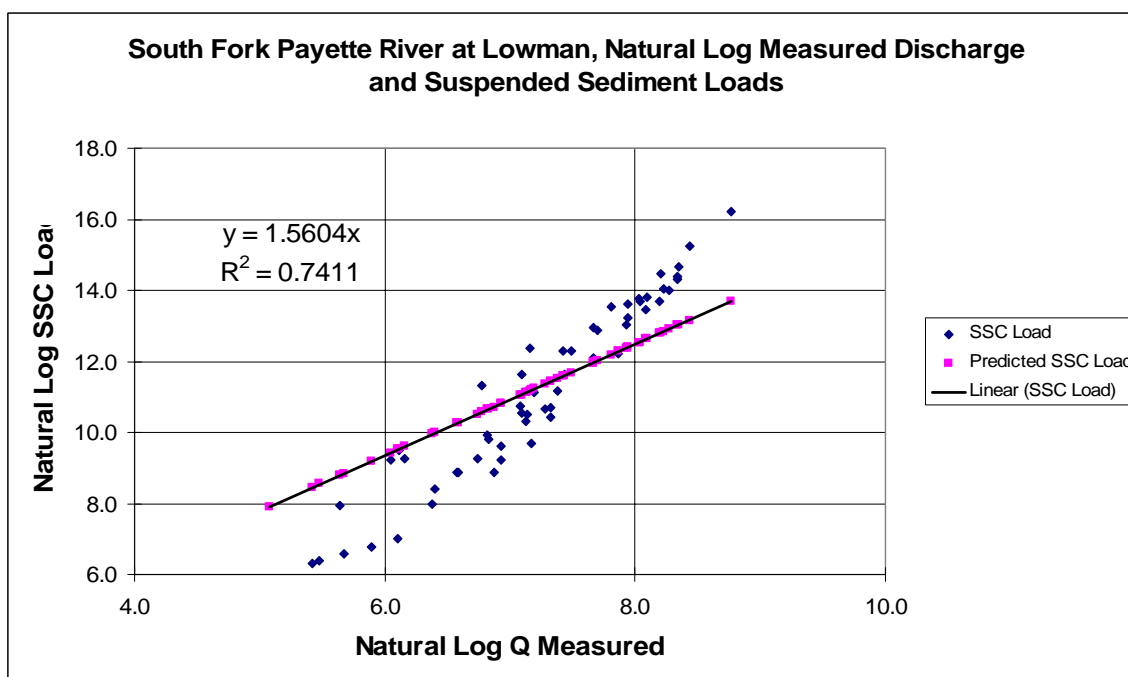
Figure 18. Measured Sediment Concentrations, 1991 through 2001

Six years of suspended sediment concentration (SSC) data, measured by USGS at the Lowman Gage Site (USCS 13235000), are available (Table 9). It should be noted that for years 1991 and 1997 there is only one data point for each of those years.

Table 9. Suspended Sediment Concentration Results for South Fork Payette at Lowman 1991, 1992, 1994, 1995, 1997, 1998 and 2001.

	Measured Discharge (cfs)	Measured SSC Concentration (mg/L)	Measured SSC Load (lbs/day)	Measured SSC Load (tons/day)
Average	1842	66	612118	306
Maximum	6390	692	10816612	5408
Minimum	160	1	391	0
Standard Deviation	1390	111	1568481	784
Count	57	57	57	57

With the data available for the years shown in Table 9, a sediment rating curve was developed to evaluate year round SSC loads and concentrations based on the function of discharge. Suspended sediment data and discharge data were “normalized” into natural log values. The regression analysis for the measured SSC load and discharge are seen in Figure 19.

**Figure 19. South Fork Payette River at Lowman, Natural Log Suspended Sediment Load as a Function of Discharge.**

The first step in the analysis was to calculate the sediment load based on the discharge and SSC for the date samples were collected (Appendix A). Using the average daily discharge for the dates used in the regression analysis, the estimated daily discharge value was then applied to the sediment rating curve developed for the USGS Gage at Lowman (USGS 13235000).

$$\ln(y) = 1.5604\ln(x)$$

$$r^2 = 0.74$$

The value obtained as the estimated suspended sediment for that day's normal (average) discharge is shown as y . The variable $\ln(x)$ is the natural log value for the average (normal) discharge for that date. So, the estimated suspended sediment load would appear as:

$$\text{SS Load } \ln(y) = 1.5604\ln(x) \text{ or}$$

$$\text{SS Load } (y) = \exp(1.5604\ln(x))$$

As an example, for the date July 16, 1998, the following natural log values were obtained:

$$\text{Measured SSC} = 16 \text{ mg/L}$$

$$\text{Natural Log Measured Discharge} = 7.0817 \text{ (1190 cfs)}$$

$$\text{Natural Log Measured SSC Load} = 10.7488 \text{ (23.3 tons/day)}$$

For July 26, the estimated discharge, TSS load, and concentration would be:

$$\text{Natural Log Average Daily Discharge} = 7.0220 \text{ (1121 cfs)}$$

$$\text{Estimated Average SSC Load (for July 16)} = 28.7 \text{ tons/day}$$

$$\text{Estimated Average SSC (for July 16)} = 21 \text{ mg/L}$$

The values presented in Table 10 show the statistical analysis for the dates when actual monitoring was conducted and the results for sediment rating curve when applied to the normalized discharges for the same dates. The results from the modeling effort may underestimate high yield "slugs" of SSC associated with the rising hydrograph and/or storm events. The sediment curve rating may equally overestimate long- and short-term SSC averages.

Table 10. Measured and Estimated Discharge, Suspended Sediment Loads, Suspended Sediment Concentration, and Error Bias for South Fork Payette at Lowman.

	Measured Discharge (cfs)	Measured SSC Concentration (mg/L)	Measured SSC Load (tons/day)	Average Daily Discharge (cfs)	Estimated SSC Concentration (mg/L)	Estimated SSC Load (tons/day)
Average	1842	66	306	1866	27	70
Maximum	6390	692	5408	3025	36	135
Minimum	160	1	0	352	11	5
Standard Deviation	1390	111	784	900	8	45
Count	57	57	57	57	57	57
Square Root Error 1.79 % Difference Measure 16.2% % Difference Estimated 24.9%						

The application of the sediment rating curves offers numerous advantages over calculating the overall sediment load with measured data. The use of the rating curve “smooths” out the variables that could be associated with the monitoring conducted on any given date. This could include abnormal discharge for the date, catastrophic disturbance occurring upstream (fires, road blow-outs) or abnormal temporal or spatial climatic events.

Table 11 shows the results the for the sediment rating curve, using normalized discharge data for the South Fork Payette at Lowman.

Table 11. Normalized Discharge and Estimated Average Suspended Sediment Concentration and Loads for South Fork Payette at Lowman.

	Normalized Discharge (cfs)	Estimated SSC Concentration (mg/L)	Estimated SSC Load (lbs/day)	Estimated SSC Load (tons/day)
Average	852	16	50037	25
Maximum	3025	36	269975	135
Minimum	313	10	7835	4
Standard Deviation	800	8	72994	36
Count	366	366	366	366

Since applying a sediment rating curve for obtaining a normalized concentration and loads has a certain amount of bias, applying the standard error to the overall results is appropriate. In the case of the South Fork Payette River, the error bias has been determined to be 24.9%

(Table 10) of the results from the regression analysis. Table 12 shows the results if the bias is applied to the estimated values presented in Table 11.

Table 12. Application of Bias to Normalized Discharge and Estimated Average Suspended Sediment Concentration and Loads for South Fork Payette at Lowman.

	Normalized Discharge (cfs)	Estimated SSC Concentration (mg/L)	Estimated SSC Load (lbs/day)	Estimated SSC Load (tons/day)	Estimated SSC Concentration +24.9% (mg/L)	Estimated SSC Load +24.9% (tons/day)
Average	852	16	50037	25	21	31
Maximum	3025	36	269975	135	46	169
Minimum	313	10	7835	4	13	5
Standard Deviation	800	8	72994	36	10	46
Count	366	366	366	366	366	366

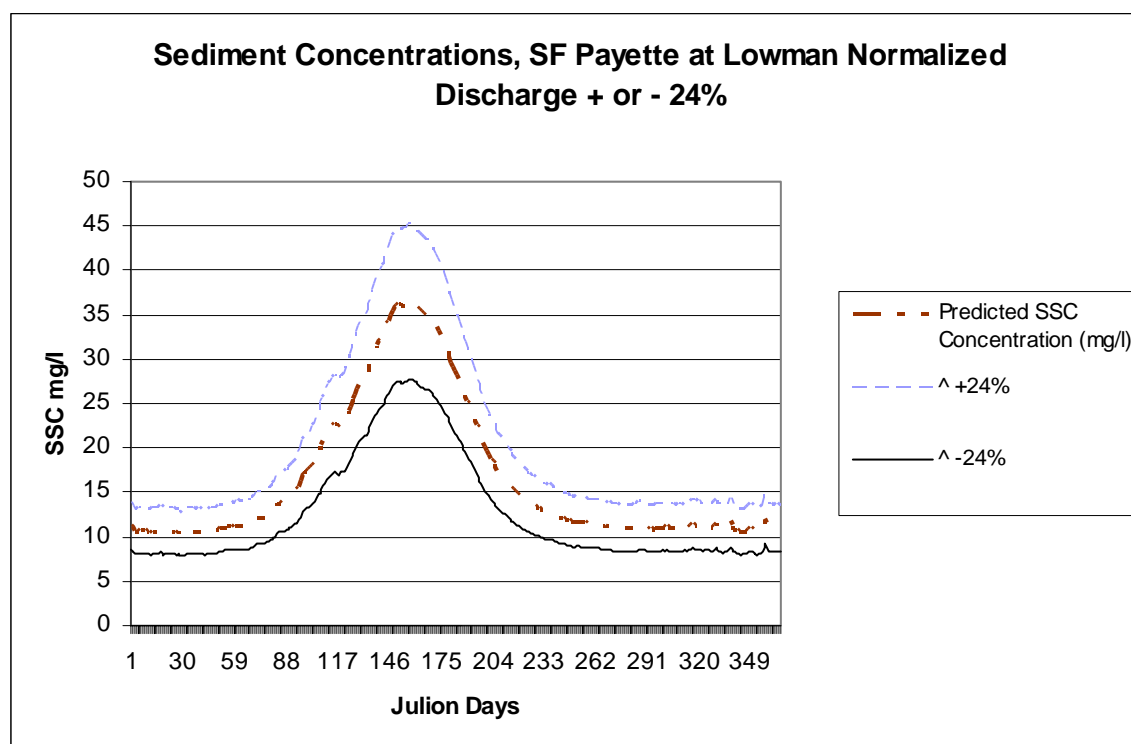


Figure 20. Sediment Concentrations, SF Payette River at Lowman Normalized Discharge + or – 24%

Appendix E. contains the statistical analysis used to calculate the normalized flow.

Department of Fish & Game
Stream Snorkel Surveys
South Fork Payette River

Snorkeling was used to identify and count fish species and numbers in the South Fork Payette River (SFPR) during August. Surveys were conducted between Lowman and Grandjean over a two day period. Two snorkelers were used, traveling in an upstream direction at all sites. Snorkel sections were measured (length and minimum of four widths) using a hand-held laser range finder (Leica model LRF 800) to calculate area surveyed, and water temperature was recorded at each snorkel site. GPS coordinates (NAD27 Conus, in UTM's) were collected at all snorkel sites using a Garmin Rino model 120 handheld GPS receiver.

A total of fourteen sites were snorkeled on the SFPR between Lowman and Grandjean on August 18-19. Redband trout, and mountain whitefish were observed at all sites (no trout were observed at Sacajawea Hot Springs site). No hatchery rainbow trout were observed. Other species observed included mountain sucker *Catostomus platyrhynchus*, and one westslope cutthroat trout *O. clarki lewisii*.

Overall, 64% (9/14) of the sites snorkeled had redband trout densities lower in 2003 than in 1996 (Allen et al. 1999), and 36% (5/14) had densities higher. Total redband densities have declined since 1989 for all size classes (Table 2). Densities by section ranged from 0.10 to 2.82 redband trout/100 m² (Table 3). Very few redband trout >300 mm were observed. The areas with the highest observed densities corresponded with two general locations, Grandjean and Lowman (Table 3). Both areas are adjacent to river reaches with very difficult angler access.

Densities of mountain whitefish ranged from 0.13 to 1.01 fish/100 m², lower than measured between 1988-1990, but have increased since 1996 (Table 3).

Approximately thirteen thousand catchables per year were stocked in the SFPR between 1990-1999 (Table 4). The highest densities of hatchery rainbow trout documented while snorkeling occurred in 1988 and 1989 (0.23 and 0.5 fish/100 m², respectively), both were drought years in which a total of 31,000 catchables were stocked (Table 2). Between 1990 and 1997, densities of hatchery rainbow trout observed while snorkeling ranged from 0.02 to 0.05 fish/100 m². Stocking of the SFPR was eliminated in 1999 following the construction of two put-and-take catchable ponds near the Ten-Mile Bridge above Lowman.

Personal Communication
Jeff Dillon, Idaho Department of Fish & Game

Another, perhaps more significant limitation (to the fishery), is the basic productivity of the drainage. The granitic batholith watersheds in Idaho all have relatively low fish densities and fish growth rates compared to more productive drainages farther south. The loss of marine nutrients with extirpation of anadromous fish has almost certainly reduced productivity from historic levels, but the basic geology plays a role also.

River BURP Site 98RBOIP003
Periphyton (RDI)

>50% *Achnanthes minutissima* indicates this site has been subject to moderate stress / disturbance, either natural or man made. Stress may be physical (fast current, scour), biological (grazing), or chemical (heavy metals). Diatom flora indicates low nutrient levels and little sedimentation; cool water.

Mountain streams with fast currents, cold waters, and low nutrient levels sometimes produce diatom assemblages with low diversities and large percentages of *Achnanthes minutissima* (Bahls 1993).

Table 13. Values of diatom association metrics for Idaho rivers in 1998

River	Taxa Counted	Diversity Index	Pollution Index	Dominant Taxon	Siltation Index	Disturbance Index	% Abnormal Valves
SF Payette	38	2.41	2.56	54.2	7.9	54.2	0

The RDI score for this site is 40. As seen below, the category rating for the site is “3”.

Table 14. Macroinvertebrates (RMI)

River	#Taxa	% Dominance	Total EPT Taxa	% Elmidae Taxa	% Predator Taxa
SF Payette	35	13.36	15	0.98	3.54

The RMI score for this site is 19. As seen below, the category rating for the site is “3”.

In accordance with the Water Body Assessment Guidance (WBAG II, DEQ 2002), the site is considered to be fully supporting beneficial uses. This is based on two indices with an average score of greater than “2”.

Excerpt from the Water Body Assessment Guidance, DEQ 2002

6.4.2. River Index Scoring

6.4.2.1. Biological and Physicochemical Indexes

DEQ uses BURP-compatible data to calculate the River Macroinvertebrate Index (RMI), River Fish Index (RFI), and River Diatom Index (RDI). The results from these indexes are used to evaluate support use of cold water aquatic life in rivers.

The RMI, RFI, and RDI are direct biological measures of cold water aquatic life. Scoring methods used for the river biological indexes differ according to the techniques used to develop the indexes. The RMI and RFI used reference condition approaches similar to those methods used in the development of the SMI and SFI. The developers of the RMI and RDI did not adjust index scores to a 100-point scale. Therefore, the maximum score of these indexes are the highest scores of the individual metrics comprising the indexes.

Both the RMI and RFI base condition categories on the 25th percentile of reference condition, which is considered adequately conservative in identifying sites in good condition (Jessup and Gerritsen 2000). For the RMI, Royer and Minshall (1996) recommended the minimum score of the reference condition to distinguish additional condition categories. DEQ evaluated the range in each condition category of the RMI and then linearly extended the range to identify a minimum threshold.

The development of the RDI scores were based upon the distribution of the entire data set rather than just reference sites, due to the limited number of reference sites. Fore and Grafe (2000) recommend scores assigned to the different index categories based on the 75th, 50th, and 25th percentiles. Fore and Grafe (2000) did not have supporting analysis to recommend a minimum threshold.

Similar to the stream cold water aquatic life approach, each condition category is assigned a rating of 1, 2, or 3. This rating assignment allows DEQ to effectively integrate multiple index results into one score. The final score derived from these multiple data sets is then used to determine use support. Table 14a summarizes the scoring and rating categories for the RMI, RDI, RFI, and RPI.

Table 14a. RMI, RDI, RFI, and RPI Scoring and Rating Categories.

Index	Minimum Threshold	1	2	3
RMI	<11	11 – 13	14 – 16	>16
RDI	NA ¹	<22	22 – 33	>34
RFI	<54	54-69	70-75	>75
RPI	<40	40 – 70	70 – 80	>80

¹ Fore and Grafe (2000) did not identify a minimum threshold category.

Table 15. USGS Monitoring South Fork Payette River @ Lowman¹

Sample Date	Site Type	Reach Length (m)	Stream Depth (m)	Stream Width (m)
8/31/1998	Forest	465	0.15	55
Discharge (cfs)	Stream Velocity (f/s)	Spec Cond (µS/cm)	% Open Canopy	% Substrate Fines
460	1.96	85	41	0
% Embeddedness	Stream Gradient	DO (mg/L)	DO % Saturation	pH (SU)
15	0.83	9	102	7.8
Max water temp (96-98)	Habitat Quality Index			
19.3	67			

Table 16. Macroinvertebrate metrics and invertebrate river index (IRI)¹**Richest targeted habitat (RTH)**

Total Abundance (individuals /m²)	No. Cold Water Taxa	% Cold Water Taxa	% Dominant Taxa	Total No. of Taxa
4340	6	5.23	27.81	45
EPT Taxa	% Elmidae	% Predators	IRI Score	
25	2.7	7.43	23	

¹ Evaluation of Macroinvertebrate Assemblages in Idaho Rivers Using Multimetric and Mutivariate Techniques, 1996-98, Water Resources Investigations Report 01-4145, Terry R. Maret, Dorene E. MacCoy, Kenneth D. Skinner, Susan E. Moore and Ivalou O'Dell, US Geological Survey, Boise, Idaho 2001.

Status of Beneficial Uses

The analysis indicates that during *normal- and low-flow years*, the suspended sediment concentrations in the South Fork Payette River are not expected to exceed the durational targets of 50 mg/L for 60 days and 80 mg/L for 14 days. Consequently, DEQ does not recommend preparing an explicit sediment TMDL for the South Fork Payette River. However, the data do show that, in high flow, high run-off, years, the SSC concentrations exceed the targets. The South Fork Payette River Subbasin is almost entirely forested and the land uses in the subbasin are almost entirely forest activities. In areas of forest activities, roads are the primary human-induced source of stream sediment (Megahan and Kidd 1972, Bauer et al. 1985, Harvey et al. 1989, Hoelscher et al. 1993, Zaroban et al. 1997). As such, roads should be managed to prevent or reduce sediment loss. More details are given in section 3.0 of this subbasin assessment.

Fine-grained sediment from timber harvest, rangeland, agriculture, recreation, and urban sources are not considered major in this subbasin assessment given their relatively small contribution when compared to roads, natural background, and landslides.

Table 17 summarizes the beneficial use support status in the South Fork Payette River as it relates to the pollutant of concern (sediment) in the river.

Table 17. Status of beneficial uses for the South Fork Payette River.

Stream / Segment	Beneficial Uses Support Status	Impaired Use ¹	Comments
South Fork Payette River - Wilderness Boundary to Payette River	Not Impaired	None	Targets not exceeded in normal flow years. Targets exceeded in high flow years. Forest roads should be managed to prevent sediment loss in high run-off years.

¹ Cold Water Aquatic Life

Other Water Bodies

Through DEQ's Beneficial Use Reconnaissance Program (BURP), data have been collected since 1993 for wadeable streams in the South Fork Payette River Subbasin. This data was used to evaluate waters other than the mainstem South Fork Payette River. The BURP program is aimed at determining the physical, chemical, and biological integrity of water bodies by collecting and analyzing reconnaissance-level data. The intent of the program is not to identify an impairing pollutant. Rather, the intent is to determine whether impairment exists. If impairment exists, additional evaluations must be performed to determine the pollutant(s) of concern.

Using the fish, macroinvertebrate (aquatic insect), and habitat data from the BURP sites, a conclusion can be reached regarding the cold water aquatic life beneficial use support status of each stream. This support status is determined following the methods outlined in the DEQ Water Body Assessment Guidance document (Grafe et al. 2002). The assessment method essentially applies multimetric indexes to the habitat, macroinvertebrate, and habitat data to gage the overall health of the stream ecosystem. Using the results from each index, a support status for the stream is generated. Table 18 shows the results of the multimetric analyses for the available BURP data in the subbasin.

Table 18. BURP results for wadeable streams in the South Fork Payette River basin.

BURP ID	Stream Name	Cold Water Aquatic Life Support Status	Metrics on which the support status is based
1993SBOIA023	DEADWOOD RIVER BELOW MINE	Impaired ¹	Habitat, Macroinvertebrates
1993SBOIA024	DEADWOOD RIVER ABOVE MINE	Not impaired	Habitat, Macroinvertebrates
1996SBOIB042	EIGHTMILE CREEK (LOWER)	Impaired ²	Habitat, Macroinvertebrates
1996SBOIB043	BIG PINE CREEK	Not impaired	Habitat, Macroinvertebrates
1996SBOIB044	SCOTT CREEK (UPPER)	Not impaired	Habitat, Macroinvertebrates
1996SBOIB045	SCOTT CREEK (LOWER)	Not impaired	Habitat, Macroinvertebrates
1996SBOIB046	EAST FORK BIG PINE CREEK	Not impaired	Habitat, Macroinvertebrates
1996SBOIB047	MIDDLE FORK BIG PINE CREEK	Not impaired	Habitat, Macroinvertebrates
1996SBOIB049	WEST FORK ALDER CREEK	Not impaired	Habitat, Macroinvertebrates
1996SBOIB050	ALDER CREEK	Not impaired	Habitat, Macroinvertebrates
1996SBOIB051	NINEMILE CREEK (LOWER)	Not impaired	Habitat, Macroinvertebrates
1996SBOIB052	NINEMILE CREEK (UPPER)	Not impaired	Habitat, Macroinvertebrates
1996SBOIB053	WILSON CREEK (LOWER)	Not impaired	Habitat, Macroinvertebrates
1996SBOIB054	BASIN CREEK	Not impaired	Habitat, Macroinvertebrates
1996SBOIB055	WILSON CREEK (UPPER)	Not impaired	Habitat, Macroinvertebrates
1996SBOIB056	WHITEHAWK CREEK	Not impaired	Habitat, Macroinvertebrates
1997SBOIB038	DANSKIN CREEK(LOWER)	Not impaired	Habitat, Macroinvertebrates
1997SBOIB039	HORN CREEK	Impaired	Habitat, Macroinvertebrates
1997SBOIB040	WASH CREEK(LOWER)	Impaired	Habitat, Macroinvertebrates
1997SBOIB041	WASH CREEK(UPPER)	Not impaired	Habitat, Macroinvertebrates
1997SBOIC025	BEAR CREEK	Not impaired	Habitat, Macroinvertebrates
1997SBOIC026	CAMP CREEK	Not impaired	Habitat, Macroinvertebrates
1997SBOIC027	CANYON CREEK(UPPER)	Not Impaired	Habitat, Macroinvertebrates
1997SBOIC028	FOX CREEK	Not impaired	Habitat, Macroinvertebrates
1997SBOIC029	CHAPMAN CREEK	Impaired	Habitat, Macroinvertebrates
1997SBOIC030	MACDONALD CREEK	Not impaired	Habitat, Macroinvertebrates
1997SBOIC031	KETTLE CREEK	Not impaired	Habitat, Macroinvertebrates
1997SBOIC032	TENMILE CREEK(LOWER)	Not impaired	Habitat, Macroinvertebrates
1997SBOIC033	TENMILE CREEK(UPPER)	Not impaired	Habitat, Macroinvertebrates
1997SBOIC039	ROCK CREEK(LOWER)	Not impaired	Habitat, Macroinvertebrates
1997SBOIC040	ROCK CREEK(UPPER)	Not impaired	Habitat, Macroinvertebrates
1997SBOIC042	SMOKEY CREEK(UPPER)	Not impaired	Habitat, Macroinvertebrates
1997SBOIC043	SMOKEY CREEK(LOWER)	Impaired	Habitat, Macroinvertebrates

Table 18 (Cont.). BURP results for wadeable streams in the South Fork Payette River basin.

2001SBOIV001	MIDDLE FORK BIG PINE CREEK	Not impaired	Habitat, Macroinvertebrates
2001SBOIA006	MILLER CREEK	Not impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA046	ALDER CREEK	Not Impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA047	MIDDLE FORK BIG PINE CREEK	Not impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA048	ROCK CREEK	Not impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA049	EIGHTMILE CREEK	Not impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA050	CLEAR CREEK	Not Impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA055	WAPITI CREEK	Not impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA056	SOUTH FORK PAYETTE RIVER	Not Impaired	Habitat, Macroinvertebrates
2001SBOIA057	GOAT CREEK	Not Impaired	Habitat, Macroinvertebrates
2001SBOIA058	BARON CREEK	Not Impaired	Habitat, Macroinvertebrates
2001SBOIA060	NORTH FORK CANYON CREEK	Not impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA061	WARM SPRING CREEK	Not Impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA062	FIVEMILE CREEK	Not impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA063	SCOTT CREEK	Not impaired	Habitat, Macroinvertebrates, Fish
2001SBOIA064	CLEAR CREEK (UPPER)	Not impaired	Habitat, Macroinvertebrates, Fish
2002SBOIA037	MIDDLE FORK BIG PINE CREEK	Not impaired	Habitat, Macroinvertebrates, Fish
2002SBOIA049	WARM SPRINGS CREEK	Not Impaired	Habitat, Macroinvertebrates
2002SBOIA050	DEADWOOD RIVER	Not Impaired	Habitat, Macroinvertebrates
2002SBOIV003	MIDDLE FORK BIG PINE CREEK	Not Impaired	Habitat, Macroinvertebrates

¹ 2002 BURP monitoring indicates that this site is no longer impaired.

² 2001 BURP monitoring indicates that this site is no longer impaired.

Of the three variables (fish, habitat, and macroinvertebrates) used to assess the beneficial use support status in streams, fish represents the variable that offers the most economic benefit to local stakeholders. In 2001, DEQ collected reconnaissance-level fish data in the South Fork Payette River Subbasin. These data are summarized in Table 19. Abbreviations used in the column headings are defined as follows:

- WBID = DEQ water body index number
- RBT = rainbow trout
- BLT = bull trout
- SUK = sucker (genus *Catostomus*)
- SHS = shorthead sculpin
- LND = longnose dace.

The numbers given under the columns of fish taxa indicate the number of age class estimated to be present. The lower case “j” indicates one of the age classes represented juvenile fish. Blank cells in the table indicate no data were available for this assessment.

Table 19. Summary of DEQ reconnaissance fish data collected in 2001.

WBID	Water Body	Description	RBT	BLT	SUK	SHS	LND
1	SF Payette River	Trail Creek to mouth	2/j		1		
2	Rock Creek	source to mouth	3/j			2	
4	Wapiti Creek	source to mouth	3/j			3/j	
9	Canyon Creek	source to mouth		1/j			
10	Warm Spring Creek	source to mouth	1/j			3/j	1
11	Eightmile Creek	source to mouth	3/j			2	
12	Fivemile Creek	source to mouth	3/j				
13	Clear Creek	source to mouth	2/j	2/j		2	
20	Scott Creek	source to mouth	1	3			
21	Big Pine Creek	source to mouth	4/j				

Table 19 shows that multiple age classes of salmonids, including juveniles, are present in most streams where BURP data are available. The presence of juvenile fish is an indicator that the species is spawning in the stream. Note that juvenile bull trout were located in Canyon Creek and Clear Creek.

Bull trout are the most sensitive fish species known to occur in the South Fork Payette River Subbasin. Governor Philip E. Batt issued a bull trout conservation plan for Idaho (Batt 1996) that identified the South Fork Payette River and the Deadwood River as key bull trout watersheds. A problem assessment was prepared for these two watersheds (Jimenez and Zaroban 1998) in which fine-grained sediment was identified as a factor reducing the functional condition of bull trout habitat.

Chapman Creek

As shown in Table 20, BURP monitoring conducted in 1997 indicated Chapman Creek is not supporting beneficial uses. This determination was based on condition ratings found in the Water Body Assessment Guidance II (WBAGII) (DEQ, 2002).

Biological and Other Data

At least two indices are required to determine support status. If two indices are not available, the water body is classified as not assessed. The Stream Macroinvertebrate Index (SMI) and Stream Habitat Index (SHI) were used for Chapman Creek. Table 21 and 22 shows the metric results used to determine the final SMI and SHI index scores used for Chapman Creek. The final condition rating is shown in Table 22. Further information and data used to determine final metric and index scores are available in Appendix C.

Additional periphyton were collected in 1997. However, at this time, an assessment method for the periphyton metrics has not been developed to assist in determining the support status for wadeable streams. Periphyton along with macroinvertebrate data may be used to indicate stress in the watershed.

Table 20. Stream Macroinvertebrate Metrics and Results for Final SMI Score for Chapman Creek.

Metric	Metric Result	SMI^a Metric Score
Number of Taxa	15	
Number Ephemeroptera Taxa	5	
Number Plecoptera Taxa	3	
Number Tricoptera Taxa	2	
Percent Plecoptera	7.3%	
HBI ^b	5.4	
Percent 5 Dominant Taxa	79.3%	
Scraper Taxa	5	
Clinger Taxa	9	
Total SMI Index Score		40.62
Condition Rating		1

^a Stream Macroinvertebrate Index, ^b Hilsenoff Biotic Index

Table 21. Stream Habitat Metrics and Results for Final SHI Score for Chapman Creek.

Metric	Metric Result	SHI^a Metric Score
Stream Cover	4	4
Embeddedness	6	6
Disruptive Pressure	2	2
Zone of Influence	2	2
Percent Fines	10	10
Bank Cover	0	0
Canopy Score	1	1
Channel Shape	1	1
Wolman Count	7	7
Large Organic Debris	0	0
Total SHI Index Score		33
Condition Rating		1

^a Stream Habitat Index

Table 22. Final Condition Rating for Chapman Creek.

Site/BURP ID	SMI ^a Score	SMI ^b Condition Rating	SFI ^c Score	SFI ^d Condition Rating	SHI ^e Score	SHI ^f Condition Rating	Condition Rating ^g
Chapman Creek 1997SBOIC029	40.62	1	NA	NA	33	1	1

^a Stream Macroinvertebrate Index; ^b ≥ 59 Condition Rating = 3, 49-58 Condition Rating = 2, 31-50 Condition Rating = 1, < 33 Condition Rating = Below Minimum Threshold; ^c Stream Fish Index; ^d ≥ 81 Condition Rating = 3, 67-80 Condition Rating = 2, 34-66 Condition Rating = 1, < 34 = Condition Rating = Below Minimum Threshold; ^e Stream Habitat Index ≥ 63 Condition Rating = 3, 50-62 Condition Rating = 2, < 50 Condition Rating = 1. ^g Average Index Score, two indices required, Below Minimum Threshold if any of the Metric is below

Discharge (Flow) Data

The only available discharge data is from a one-time monitoring event conducted in 1997 during the BURP monitoring. The flow measured 10 cfs on September 17, 1997. Further analysis through hydrologic modeling can be conducted if needed. However, at this time, it appears Chapman Creek would meet the physical criteria to support cold water aquatic life and/or primary contact recreation (DEQ 2001).

In late December 1996 and early January 1997, a rain-on-snow event triggered record discharge events on many watersheds in southwest Idaho. During these events, mid-elevation (4000-6000 foot) snow pack melted rapidly, creating flashfloods on both small and large watersheds. It is well documented that these events were responsible for the “blow-out” of many streams and rivers throughout southwest Idaho. The 1997 BURP habitat data documented that Chapman Creek was impacted (stream morphology) by a high discharge event. Since the 1997 BURP habitat data is being used to assess the status of beneficial uses in Chapman Creek, the above mentioned hydrologic event should be considered.

Figures 21 and 22 shows the 1997 Chapman Creek BURP site. Figures 23 and 24 show the same site in 2004. As demonstrated in the photos, Chapman Creek has been greatly influenced by hydrologic events, which resulted in the movement of large amounts of bedload sediment. It appears the riparian vegetation is improving. However, the process will be slowed by the lack of fine sediment and organic material.

Figure 25 shows the 1997-1998 10-meter LANDSAT imagery of the Chapman Creek watershed. In the northern section of the watershed, a large area of mass wasting has occurred. It is unclear if this can be contributed to the 1997 rain-on-snow event, but it appears to be a recent event as dated by the imagery. Since the Chapman Creek watershed is mostly roadless (Figure 26) and there is no indication of recent catastrophic fire activity, this mass wasting could be classified as a naturally occurring event. In all likelihood, the unstable hydrological condition in the Chapman Creek watershed will continue until the mass wasting stabilizes.



Figure 21. Chapman Creek 1997



Figure 22. Chapman Creek 1997



Figure 23. Chapman Creek 2004



Figure 24. Chapman Creek 2004

South Fork Payette River Chapman Creek Watershed

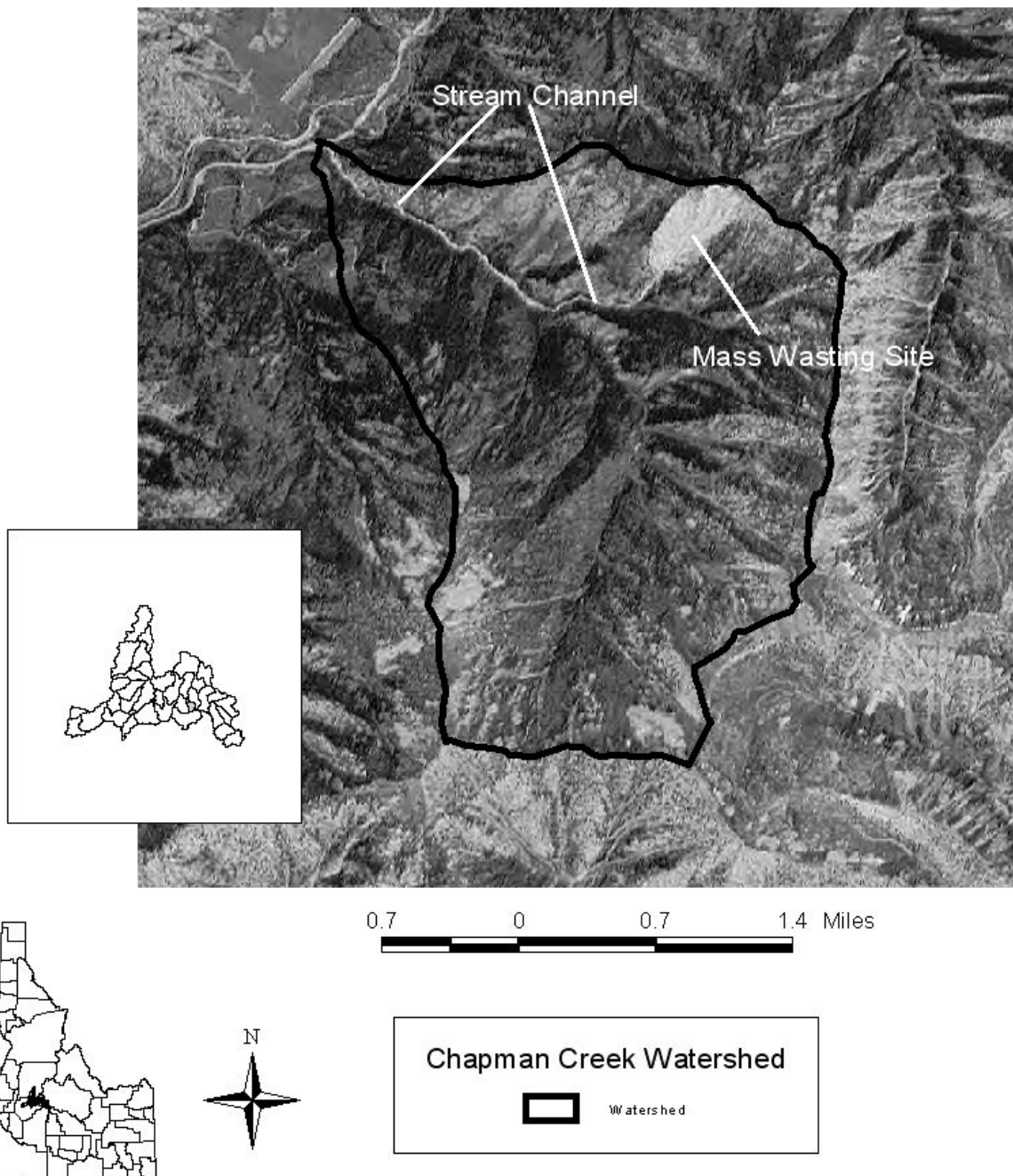


Figure 25. Chapman Creek Watershed. 10 Meter LANDSAT Imagery.

Chapman Creek Watershed Roads

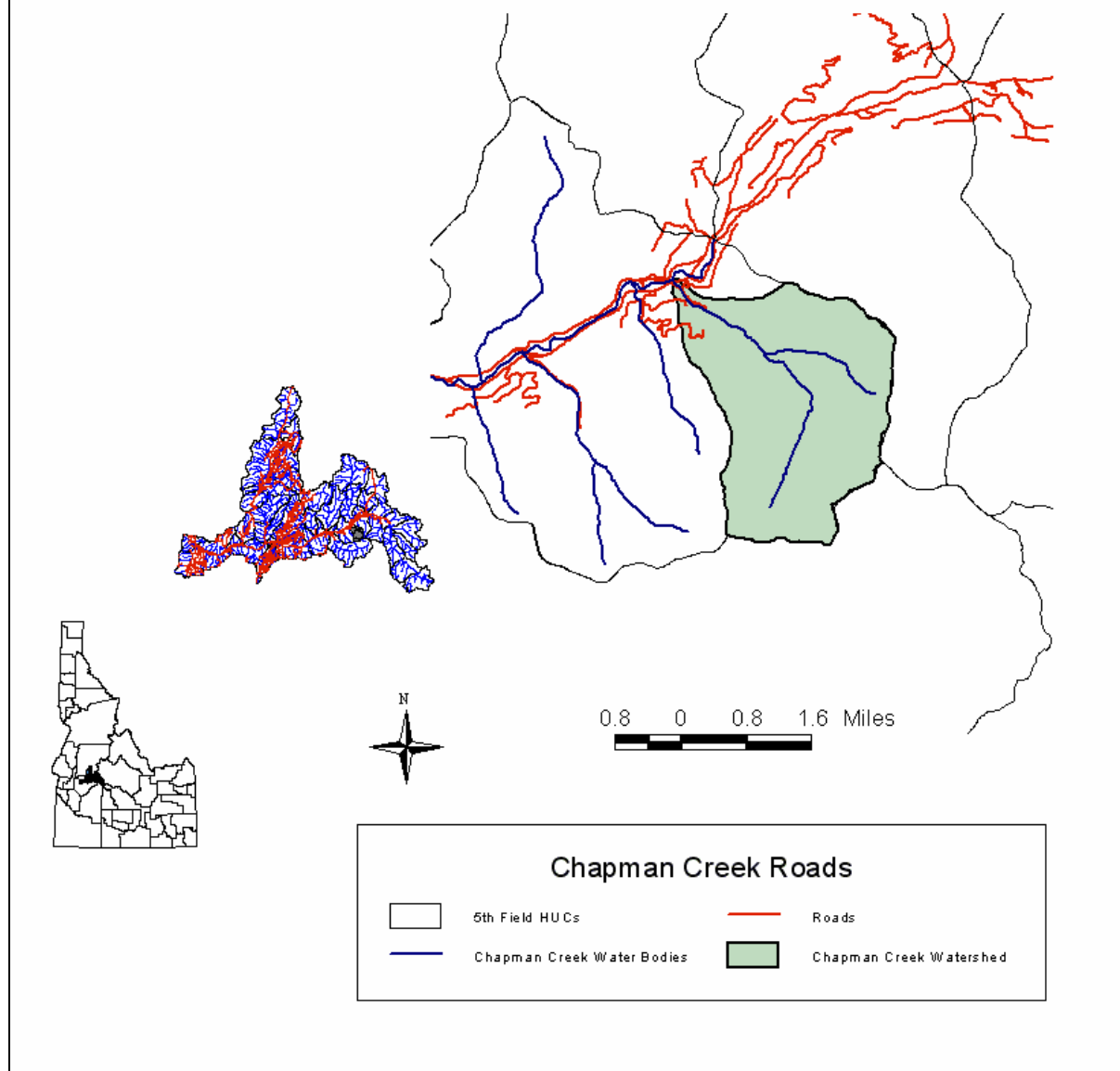


Figure 26. Chapman Creek Watershed. Roads.

Sediment/Substrate Analysis

There is no data available to assess a suspended sediment or bedload sediment load for Chapman Creek. During baseflow periods, there is usually little energy to transport and/or suspend sediment. Therefore, monitoring for these parameters during baseflow would provide little information for sediment loading analysis.

As discussed previously, bedload sediment can impair beneficial uses. Percent fines is a measurement of substrate that consists of material less than 6.0 mm in size. When percent fines exceeds 30%, impairment associated with indicator species is noted (Relyea, Minshall, and Danehy 2000 and DEQ 1990). In 1997, Wolman pebble counts were conducted as part of the BURP monitoring. In 2004, Wolman pebble counts were again collected. The results from the substrate assessments are shown in Tables 23 and 24.

Table 23. 1997 Percent Fines \leq 6mm. BURP Site 1997SBOIC029, Chapman Creek.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 1997SBOIC029	2.3%	46.0%	32.6%

Table 24. 2004 Percent Fines \leq 6mm. BURP Site 1997SBOIC029, Chapman Creek.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 1997SBOIC029	5.1%	14.5%	8.6%

Status of Beneficial Uses

Although 1997 BURP data indicated beneficial uses are not fully supported, further examination of natural occurring conditions would indicate that this is a short duration situation. Until the additional recruitment of organic material (vegetation) occurs, Chapman Creek's biological community will remain relatively sterile, and this may continue until the mass wasting seen in Figure 25 stabilizes.

BURP monitoring was conducted in the summer of 2004; however, this information is not yet available. The biological communities and habitat will in all likelihood show little change from what was found in 1997. Further evaluation and tracking of the biological and habitat indicators may provide benchmark or reference conditions. Table 25 shows the final status call for Chapman Creek.

Table 25. Status of beneficial uses in the South Fork Payette River basin.

Stream / Segment	Beneficial Uses Support Status	Impaired Use ¹	Comments
Chapman Creek	Not Fully Supported	CWAL	Impairment due to natural conditions

¹ Cold Water Aquatic Life

Smokey Creek

As shown in Table 18, BURP monitoring conducted in 1997 indicated Smokey Creek is not supporting beneficial uses. This determination was based on condition ratings found in the WBAGII (DEQ, 2002).

Biological and Other Data

At least two indices are required to determine support status. If only one of the indices is available, the water body is classified as not assessed. Two indices, SMI (macroinvertebrates) and SHI (habitat), were used to determine support status of the beneficial uses in Smokey Creek. Additional periphyton were collected in 1997. However, at this time, an assessment method for periphyton has not been developed to assist in determining the support status for wadeable streams.

Tables 26 through 29 show the individual metric results used to determine the final SMI and SHI scores for Smokey Creek. The final condition rating is shown in Table 30. Further information and data used to determine final metric and index scores are available in Appendix C.

Table 26. Stream Macroinvertebrate Metrics and Results for Final SMI Score for Smokey Creek Upper.

Metric	Metric Result	SMI ^a Metric Score
Number of Taxa	29	
Number Ephemeroptera Taxa	9	
Number Plecoptera Taxa	7	
Number Tricoptera Taxa	3	
Percent Plecoptera	17.61%	
HBI ^b	5.40	
Percent 5 Dominant Taxa	79.27%	
Scraper Taxa	9	
Clinger Taxa	20	
Total SMI Index Score		70.11
Condition Rating		3

^a Stream Macroinvertebrate Index, ^b Hilsenoff Biotic Index

Table 27. Stream Habitat Metrics and Results for Final SHI Score for Smokey Upper Creek.

Metric	Metric Result	SHI ^a Metric Score
Stream Cover	2	
Embeddedness	8	
Disruptive Pressure	2	
Zone of Influence	1	
Percent Fines	7	
Bank Cover	0	
Canopy Score	0	
Channel Shape	3	
Wolman Count	7	
Large Organic Debris	5	
Total SHI Index Score		35
Condition Rating		1

^a Stream Habitat Index**Table 28. Stream Macroinvertebrate Metrics and Results for Final SMI Score for Lower Smokey Creek.**

Metric	Metric Result	SMI ^a Metric Score
Number of Taxa	24	
Number Ephemeroptera Taxa	8	
Number Plecoptera Taxa	6	
Number Tricoptera Taxa	5	
Percent Plecoptera	3.60%	
HBI ^b	6.64	
Percent 5 Dominant Taxa	39.57%	
Scraper Taxa	3	
Clinger Taxa	15	
Total SMI Index Score		47.31
Condition Rating		Below Minimum Threshold

a Stream Macroinvertebrate Index, b Hilsenoff Biotic Index

Table 29. Stream Habitat Metrics and Results for Final SHI Score for Lower Smokey Creek.

Metric	Metric Result	SHI ^a Metric Score
Stream Cover	2	
Embeddedness	6	
Disruptive Pressure	2	
Zone of Influence	1	
Percent Fines	3	
Bank Cover	0	
Canopy Score	1	
Channel Shape	3	
Wolman Count	9	
Large Organic Debris	1	
Total SHI Index Score		28
Condition Rating		1

^a Stream Habitat Index

Table 30. Final Condition Rating for Smokey Creek.

Site/BURP ID	SMI ^a Score	SMI ^b Condition Rating	SFI ^c Score	SFI ^d Condition Rating	SHI ^e Score	SHI ^f Condition Rating	Condition Rating ^g
Smokey Creek (Upper) 1997SBOIB041	70.11	3	NA	NA	35	1	2
Smokey Creek (Lower) 1997SBOIB040	47.31	Below Minimum Threshold	NA	NA	28	1	Below Minimum Threshold

a Stream Macroinvertebrate Index; b ≥ 59 Condition Rating = 3, 49-58 Condition Rating = 2, 31-50 Condition Rating = 1, < 33 Condition Rating = Below Minimum Threshold; c Stream Fish Index; d ≥ 81 Condition Rating = 3, 67-80 Condition Rating = 2, 34-66 Condition Rating = 1, < 34 = Condition Rating = Below Minimum Threshold; e Stream Habitat Index; f ≥ 63 Condition Rating = 3, 50-62 Condition Rating = 2, < 50 Condition Rating = 1. g Average Index Score, two indices required

Discharge (Flow) Data

The only available discharge data is from a one-time monitoring event conducted on September 25, 1997 during the BURP monitoring. The flow measured 0.2 cfs at the upper Smokey Creek site and 1.1 cfs at the lower site. Further analysis through hydrologic modeling can be conducted if needed. However, at this time, it appears lower Smokey Creek would only meet the physical criteria to support cold water aquatic life. The lower site appears to maintain adequate discharge for cold water aquatic life and secondary contact recreation (DEQ 2001).

In late December 1996 and early January 1997, a rain-on-snow event triggered record discharge events on many watersheds in southwest Idaho. During these events, mid-elevation (4000-6000 foot) snow pack melted rapidly, creating flashfloods on smaller and larger watersheds. The 1997 BURP data documented that Smokey Creek was impacted by this high-discharge event. The hydrologic event in 1997 must be taken into account when assessing the 1997 BURP habitat data in Smokey Creek.

Figure 27 shows the 1997-1998 LANSAT imagery for the Smokey Creek watershed. Two items that can be noted in the imagery are the lack of vegetation in the upper portions of the watershed and the indication of a hydrologic event at both BURP sites. The lack of vegetation is associated with the 1989 Lowman Complex Fires. The hydrologic events are probably associated with the 1997 rain-on-snow climatic condition earlier in the year and the lack of vegetation due to the 1989 fires.

During the 1997 floods, State Highway 21 was affected with mudslides and blowouts. Figures 28 through 32 show the BURP sites in 2004. Unfortunately, photos taken in 1997 could not be located. It is suspected the 1997 rain-on-snow event overwhelmed both culverts located on Smokey Creek, causing water to back up until it spilled over the highway. This then caused the erosion of road fill on the downslope side of the highway, which led to the complete blow-out of the highway at the switchbacks. Continued head cutting upstream would have continued until a hydrologic equilibrium was reached. As evident in Figure 32,

this head cutting along with some lateral cutting directly affect the area associated with the road fill. Figure 33 shows the location of Highway 21 in the watershed.

Since 1997, Highway 21 has been reconstructed at the switchbacks associated with Smokey Creek. Metal culverts have been replaced with larger concrete structures. Additionally, metal grates have been installed over the openings of the metal culverts to prevent large debris from clogging the structures.

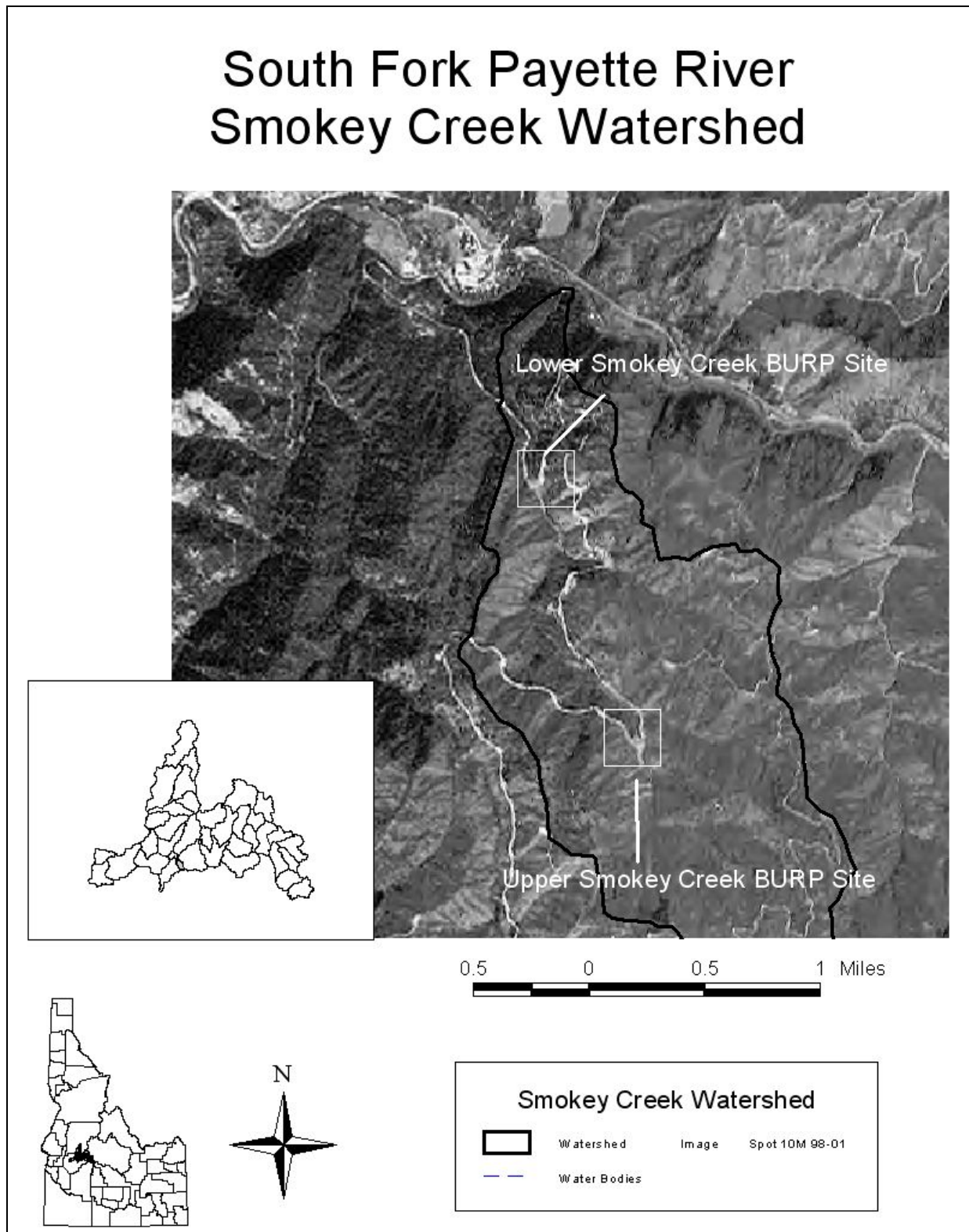


Figure 27. Smokey Creek. 1997-98 LANDSAT Imagery.



Figure 28. Smokey Creek Lower 2004



Figure 29. Smokey Creek 2004



Figure 30. Smokey Creek 2004



Figure 31. Smokey Creek 2004.



Figure 32. Smokey Creek (Upper) 2004

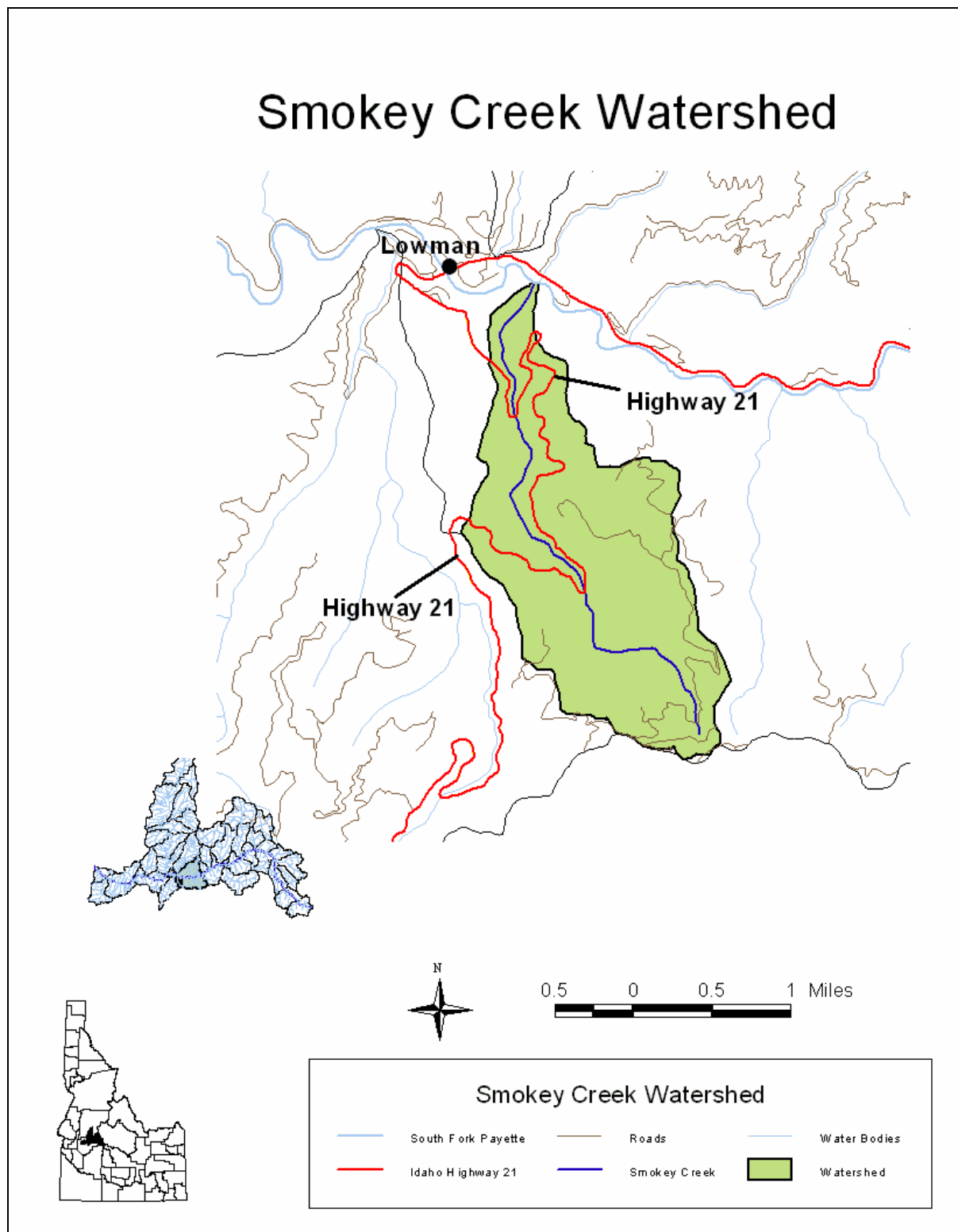


Figure 33. Road System in the Smokey Creek Watershed.

Sediment/Substrate Analysis

There is no data available to assess a suspended sediment or bedload sediment load for Smokey Creek. During baseflow periods, there is usually little energy to transport and/or suspend sediment. Therefore, monitoring for these parameters during baseflow would provide little information for sediment loading analysis.

As discussed previously, bedload sediment can impair beneficial uses. Percent fines is a measurement of substrate that consists of material less than 6.0 mm in size. When percent fines exceeds 30%, impairment associated with indicator species is noted (Relyea, Minshall, and Danehy 2000 and DEQ 1990). In 1997, Wolman pebble counts were conducted as part of the BURP monitoring. In 2004, Wolman pebble counts were again collected on the lower Smokey Creek site. The results from the substrate assessments are shown in Tables 31 through 33.

As discussed previously, sediment can impair beneficial uses in suspension and in stream substrate. Percent fines is a measurement of substrate consisting of material less than 6.0 mm in size. It has been demonstrated when percent fines exceed 30%, impairment associated with indicator species is noted (Relyea, Minshall, and Danehy 2000 and DEQ 1990). In 1997 Wolman pebble counts were conducted as part of the BURP monitoring. In 2004, Wolman pebble counts were reassessed. The results from the substrate assessments are shown in Tables 31 through Table 33.

Table 31. 1997 Percent Fines \leq 6mm. BURP Site 1997SWIROB41, Upper Smokey Creek.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 1997WIROC42	30.8%	49.1%	36.0%

Table 32. 1997 Percent Fines \leq 6mm. BURP Site 1997SWIROB40, Lower Smokey Creek.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 1997SWIROC43	21.4%	76.0%	42.7%

Table 33. 2004 Percent Fines \leq 6mm. BURP Site 1997SWIROB40, Lower Smokey Creek.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 1997SWIROC43	28.8%	63.0%	37.3%

Status of Beneficial Uses

The 1997 BURP data indicate that Smokey Creek is not supporting its beneficial uses. In all likelihood, two catastrophic events, the rain-on-snow event in 1996-1997 and the Lowman Complex Fires in 1989, are significant factors in this finding.

Figures 28-32 show improvement in stream habitat. Young woody species have been reestablished, and bank stability has improved. Streamside vegetation has reintroduced nutrients and shade to the system. During reconstruction of Highway 21 Best Management Practices (BMPs) appear to have been successfully implemented at both Smokey Creek BURP sites and this will assist in controlling future events.

Smokey Creek was monitored again in 2004 through the BURP process; however, this data is not yet available. Table 34 shows the final assessment for Smokey Creek.

Table 34. Status of beneficial uses in Smokey Creek.

Stream / Segment	Beneficial Uses Support Status	Impaired Use ¹	Comments
Smokey Creek	Not Fully Supported	CWAL	Impairment due to natural conditions

¹ Cold Water Aquatic Life

Horn Creek

As shown in Table 18, BURP monitoring conducted in 1997 indicated that Horn Creek is not supporting beneficial uses. This determination was based on condition ratings found in the WBAGII (DEQ, 2002).

Biological and Other Data

At least two indices are required to determine support status. If two metrics are not available, the water body is classified as not assessed. The Stream Macroinvertebrate Index (SMI) and Stream Habitat Index (SHI) were used for Horn Creek. Tables 35 and 36 show the metric results used to determine the final SMI and SHI index scores used. The final condition rating is shown in Table 37. Further information and data used to determine final metric and index scores are available in Appendix C.

Additional periphyton were collected in 1997. However, at this time, an assessment method for the periphyton metrics has not been developed to assist in determining the support status for wadable streams. Periphyton along with macroinvertebrate data may be used to indicate stress in the watershed.

Table 35. Stream Macroinvertebrate Metrics and Results for Final SMI Score for Horn Creek.

Metric	Metric Result	SMI ^a Metric Score
Number of Taxa	14	
Number Ephemeroptera Taxa	2	
Number Plecoptera Taxa	3	
Number Tricoptera Taxa	4	
Percent Plecoptera	1.43	
HBI ^b	4.65	
Percent 5 Dominant Taxa	60.0	
Scraper Taxa	6	
Clinger Taxa	9	
Total SMI Index Score		30.44
Condition Rating		Below Minimum Threshold

^a Stream Macroinvertebrate Index, ^b Hilsenoff Biotic Index

Table 36. Stream Habitat Metrics and Results for Final SHI Score for Horn Creek.

Metric	Metric Result	SHI ^a Metric Score
Stream Cover	4	
Embeddedness	2	
Disruptive Pressure	6	
Zone of Influence	6	
Percent Fines	10	
Bank Cover	0	
Canopy Score	2	
Channel Shape	3	
Wolman Count	8	
Large Organic Debris	7	
Total SHI Index Score		48
Condition Rating		1

^a Stream Habitat Index**Table 37. Final Condition Rating for Horn Creek.**

Site/BURP ID	SMI ^a Score	SMI ^b Condition Rating	SFI ^c Score	SFI ^d Condition Rating	SHI ^e Score	SHI ^f Condition Rating	Condition Rating ^g
Horn Creek 1997SBOIB039	30.44	Below Minimum Threshold	NA	NA	48	1	Below Minimum Threshold

a Stream Macroinvertebrate Index; b ≥ 59 Condition Rating = 3, 49-58 Condition Rating = 2, 31-50 Condition Rating = 1, < 33 Condition Rating = Below Minimum Threshold; c Stream Fish Index; d ≥ 81 Condition Rating = 3, 67-80 Condition Rating = 2, 34-66 Condition Rating = 1, < 34 = Condition Rating = Below Minimum Threshold; e Stream Habitat Index f ≥ 63 Condition Rating = 3, 50-62 Condition Rating = 2, < 50 Condition Rating = 1. g Average Index Score, two indices required

Discharge (Flow) Data

The only available discharge data is from a one-time monitoring event conducted in 1997 during the BURP monitoring. The flow measured 0.4 cfs on July 16, 1997. Further analysis through hydrologic modeling can be conducted if needed. However, at this time, it appears that Horn Creek would not meet any of the physical criteria to support cold water aquatic life and/or primary contact recreation (DEQ 2001).

In late December 1996 and early January 1997, a rain-on-snow event triggered record discharge events on many watersheds in southwest Idaho. During these events, mid-elevation (4000-6000 foot) snow pack melted rapidly, creating flashfloods on smaller and larger watersheds. It is well documented that these events were responsible for the blow-out of many streams and rivers throughout southwest Idaho. The 1997 BURP data documented that Horn Creek was impacted by this high-discharge event. Since the 1997 BURP habitat data is being used to assess the status of beneficial uses in Horn Creek, the above mentioned hydrologic event that occurred earlier should be considered.

As with Chapman Creek and Smokey Creek, a major hydrologic event occurred in the Horn Creek watershed. This occurrence was probably related to the January 1997 rain-on-snow event. The 1997 BURP habitat data indicated that the stream bank conditions were almost 100% uncovered and unstable.

Figures 34, 35, and 36 show the current physical condition of Horn Creek. Unfortunately, photos from the 1997 BURP monitoring cannot be located. Photographs taken in 2004 show the remnants of what appears to be the movement of a large amount of sediments. The valley bottom provides no access to an adequate floodplain to disperse the energy associated with a flashflood event. These physical attributes would force high flows to scour the streambed and contribute to the movement of large amount of sediments.

The vegetation in 2004 appears be made up of mostly young alders and willows. Stream bank conditions appear stable and well vegetated with young woody species.



Figure 34. Horn Creek 2004



Figure 35. Horn Creek 2004



Figure 36. Horn Creek 2004

Sediment/Substrate Analysis

There is no data available to assess a suspended sediment or bedload sediment load for Horn Creek. During baseflow periods, there is usually little energy to transport and/or suspend sediment. Therefore, monitoring for these parameters during baseflow would provide little information for sediment loading analysis.

As discussed previously, bedload sediment can impair beneficial uses. Percent fines is a measurement of substrate that consists of material less than 6.0 mm in size. When percent fines exceeds 30%, impairment associated with indicator species is noted (Relyea, Minshall,

and Danehy 2000 and DEQ 1990). In 1997, Wolman pebble counts were conducted as part of the BURP monitoring. In 2004, Wolman pebble counts were again collected. The results from the substrate assessments are shown in Tables 38 and 39.

Table 38. 1997 Percent Fines \leq 6mm. BURP Site 1997SWIROB391, Horn Creek.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 1997SWIROB39	0.0%	86.8%	74.2%

Table 39. 2004 Percent Fines \leq 6mm. BURP Site 1997SWIROB39, Horn Creek.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 1997SWIROB39	35.8%	87.1%	58.2%

Status of Beneficial Uses

The 1997 BURP data indicate that Horn Creek is not supporting its beneficial uses. In all likelihood, the rain-on-snow event in 1996-1997 is a significant factor in the stream's status as not fully supporting beneficial uses. This event moved a large volume of sediment and removed most of the vegetation along the stream corridor.

Photos taken in 2004 indicate the water body's physical attributes are improving. Young woody species have been reestablished and bank stability has improved. Streamside vegetation has reintroduced nutrients and shade to the system.

Horn Creek was monitored again in 2004 through the BURP process; however, this data is not yet available. Table 40 shows the final assessment for Horn Creek.

Table 40. Status of beneficial uses in Horn Creek.

Stream / Segment	Beneficial Uses Support Status	Impaired Use ¹	Comments
Horn Creek	Not Fully Supported	CWAL	Impairment due to natural conditions

¹ Cold Water Aquatic Life

Wash Creek

As shown in Table 18, BURP monitoring conducted in 1997 indicated that Wash Creek is not supporting beneficial uses. This determination was based on condition ratings found in the WBAGII (DEQ, 2002).

Biological and Other Data

At least two indices are required to determine support status. If two indices are not available, the water body is classified as not assessed. The Stream Macroinvertebrate Index (SMI) and Stream Habitat Index (SHI) were used for Wash Creek. Tables 41 through 44 shows the metric results used to determine the final SMI and SHI index scores used for Wash Creek. The final condition rating is shown in Table 41. Further information and data used to determine final metric and index scores are available in Appendix C.

Additional periphyton were collected in 1997. However, at this time, an assessment method for the periphyton metrics has not been developed to assist in determining the support status for wadable streams. Periphyton along with macroinvertebrate data may be used to indicate stress in the watershed.

Table 41. Stream Macroinvertebrate Metrics and Results for Final SMI Score for Upper Wash Creek.

Metric	Metric Result	SMI ^a Metric Score
Number of Taxa	27	
Number Ephemeroptera Taxa	5	
Number Plecoptera Taxa	5	
Number Tricoptera Taxa	6	
Percent Plecoptera	39.69%	
HBI ^b	5.67	
Percent 5 Dominant Taxa	74.48%	
Scraper Taxa	9	
Clinger Taxa	20	
Total SMI Index Score		71.63
Condition Rating		3

^a Stream Macroinvertebrate Index, ^b Hilsenoff Biotic Index

Table 42. Stream Habitat Metrics and Results for Final SHI Score for Upper Wash Creek.

Metric	Metric Result	SHI ^a Metric Score
Stream Cover	6	
Embeddedness	2	
Disruptive Pressure	6	
Zone of Influence	7	
Percent Fines	7	
Bank Cover	6	
Canopy Score	5	
Channel Shape	3	
Wolman Count	10	
Large Organic Debris	5	
Total SHI Index Score		57
Condition Rating		2

^a Stream Habitat Index**Table 43. Stream Macroinvertebrate Metrics and Results for Final SMI Score for Lower Wash Creek.**

Metric	Metric Result	SMI ^a Metric Score
Number of Taxa	21	
Number Ephemeroptera Taxa	5	
Number Plecoptera Taxa	2	
Number Tricoptera Taxa	4	
Percent Plecoptera	34.34%	
HBI ^b	5.78	
Percent 5 Dominant Taxa	85.35	
Scraper Taxa	6	
Clinger Taxa	17	
Total SMI Index Score		55.75
Condition Rating		2

^a Stream Macroinvertebrate Index, ^b Hilsenoff Biotic Index**Table 44. Stream Habitat Metrics and Results for Final SHI Score for Lower Wash Creek.**

Metric	Metric Result	SHI ^a Metric Score
Stream Cover	5	
Embeddedness	3	
Disruptive Pressure	3	
Zone of Influence	2	
Percent Fines	8	
Bank Cover	5	
Canopy Score	1	
Channel Shape	3	
Wolman Count	9	
Large Organic Debris	8	
Total SHI Index Score		47
Condition Rating		1

^a Stream Habitat Index

Table 45. Final Condition Rating for Wash Creek.

Site/BURP ID	SMI ^a Score	SMI ^b Condition Rating	SFI ^c Score	SFI ^d Condition Rating	SHI ^e Score	SHI ^f Condition Rating	Condition Rating ^g
Wash Creek (Upper) 1997SBOIB041	71.63	3	NA	NA	57	2	2.5
Wash Creek (Lower) 1997SBOIB040	55.75	2	NA	NA	47	1	1.5

a Stream Macroinvertebrate Index; b ≥ 59 Condition Rating = 3, 49-58 Condition Rating = 2, 31-50 Condition Rating = 1, < 33 Condition Rating = Below Minimum Threshold; c Stream Fish Index; d ≥ 81 Condition Rating = 3, 67-80 Condition Rating = 2, 34-66 Condition Rating = 1, < 34 = Condition Rating = Below Minimum Threshold; e Stream Habitat Index f ≥ 63 Condition Rating = 3, 50-62 Condition Rating = 2, < 50 Condition Rating = 1. g Average Index Score, two indices required

Discharge (Flow) Data

The only available discharge data is from a one-time monitoring event conducted in 1997 during the BURP monitoring. The flow measured 0.2 cfs at the upper site and 0.23 cfs at the lower site on July 17, 1997. Further analysis through hydrologic modeling can be conducted if needed. However, at this time, it appears Wash Creek would not meet any of the physical criteria to support cold water aquatic life and/or primary contact recreation (DEQ 2001).

In late December 1996 and early January 1997, a rain-on-snow event triggered record discharge events on many watersheds in southwest Idaho. During these events, mid-elevation (4000-6000 foot) snow pack melted rapidly creating flashfloods in the watershed. It is well documented that these events were responsible for the blow-out of many streams and rivers throughout southwest Idaho. The 1997 BURP data documented that Wash Creek was impacted by this high discharge event. Since the 1997 BURP habitat data is being used to assess the status of beneficial uses in Wash Creek, the above mentioned hydrologic event that occurred earlier should be considered.

As with Chapman Creek, Smokey Creek, and Horn Creek, a major hydrologic event occurred in the Wash Creek watershed. This occurrence was probably related to the January 1997 rain-on-snow event. The 1997 BURP habitat data indicated the stream bank conditions were almost 100% uncovered and unstable.

Figures 37, 38, and 40 show the physical attributes of Wash Creek in 1997. Figures 39 and 41 show Wash Creek in 2004. The valley bottom provides no access to an adequate floodplain to disperse the energy associated with a flashflood event. These physical attributes would force high flows to scour the streambed and contribute to the movement of large amount of sediments, which is evident in Figure 40.

The vegetation in 2004 appears be made up of mostly young alders and willows. Stream bank conditions appear stable and well vegetated with young woody species.



Figure 37. Upper Wash Creek 1997



Figure 38. Upper Wash Creek 1997



Figure 39. Upper Wash Creek 2004



Figure 40. Lower Wash Creek 1997



Figure 41. Lower Wash Creek 2004

Sediment/Substrate Analysis

There is no data available to assess a suspended sediment or bedload sediment load for Wash Creek. During baseflow periods, there is usually little energy to transport and/or suspend sediment. Therefore, monitoring for these parameters during baseflow would provide little information for sediment loading analysis.

As discussed previously, bedload sediment can impair beneficial uses. Percent fines is a measurement of substrate that consists of material less than 6.0 mm in size. When percent fines exceeds 30%, impairment associated with indicator species is noted (Relyea, Minshall, and Danehy 2000 and DEQ 1990). In 1997, Wolman pebble counts were conducted as part of the BURP monitoring. In 2004, Wolman pebble counts were again collected. The results from the substrate assessments are shown in Tables 46 through 48.

Table 46. 1997 Percent Fines \leq 6mm. BURP Site 1997SWIROB41, Wash Creek Upper.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 1997SWIROB41	35.6%	49.6%	45.6%

Table 47. 1997 Percent Fines \leq 6mm. BURP Site 1997SWIROB40, Wash Creek Lower.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 1997SWIROB40	28.3%	55.0%	46.1%

Table 48. 2004 Percent Fines \leq 6mm. BURP Site 1997SWIROB40, Wash Creek Lower.

Site	Percent Fines \leq 6mm Within Wetted	Percent Fines \leq 6mm Outside Wetted	Percent Fines \leq 6mm Outside and Within Wetted
BURP Site 2004SBOIA138	8.6%	40.5%	22.8%

Status of Beneficial Uses

The 1997 BURP data indicate Wash Creek is not supporting its beneficial uses at the lower assessment site. In all likelihood, the rain-on-snow event in 1996-1997 is a significant factor in the stream's status as not full support. This event moved a large volume of sediment and removed most of the vegetation along the stream corridor.

Photos taken in 2004 indicate the water body's physical attributes are improving. Young woody species have been reestablished, and bank stability has improved. Streamside vegetation has reintroduced nutrients and shade back to the system.

Wash Creek was monitored in 2004 through the BURP process; however, this data is not yet available. Table 49 shows the final assessment for Wash Creek.

Table 49. Status of beneficial uses in Wash Creek.

Stream / Segment	Beneficial Uses Support Status	Impaired Use ¹	Comments
Wash Creek	Not Fully Supported	CWAL	Impairment due to natural conditions

¹ Cold Water Aquatic Life

Conclusions

The segment of the South Fork Payette River extending from the wilderness boundary to the Payette River will be proposed for sediment delisting during the next §303(d)-listing cycle. Although the biological and habitat indexes for Wash Creek, Chapman Creek, Horn Creek and Smokey Creek showed impairment in 1997, naturally occurring events are in all likelihood the major causes. Table 50 summarizes the outcome of the South Fork Payette River Subbasin assessment.

Table 50. Summary of the South Fork Payette River Subbasin assessment.

Water Body	Boundary	Pollutant	Proposed Action
South Fork Payette River WQLS:5186 AU: SW001_05	Wilderness Boundary to Payette River	Sediment	De-list sediment
Wash Creek - lower WQLS:5186 AU: SW001_02	Headwaters to SF Payette River	Unknown	Use BURP monitoring to track overall stream improvements
Chapman Creek WQLS:5186 AU: SW001_02	Headwaters to SF Payette River	Unknown	Use BURP monitoring to track overall stream improvements
Horn Creek WQLS:5186 AU: SW001_02	Headwaters to SF Payette River	Unknown	Use BURP monitoring to track overall stream improvements
Smokey Creek WQLS:5186 AU:xxxx	Headwaters to SF Payette River	Unknown	Use BURP monitoring to track overall stream improvements

2.4 Data Gaps

The best available data were used to develop the South Fork Payette River Subbasin assessment. However, DEQ acknowledges there are additional data that would be helpful to increase the accuracy of the analyses. The data gaps that have been identified are outlined in Table 51.

Table 51. Data gaps identified during development of the South Fork Payette River Subbasin Assessment.

Pollutant or Other Factor	Data Gap
Flow	Multiple year flow data at locations above Lowman
Sediment	Multiple year suspended sediment concentration (SSC) data at locations above Lowman, from Deadwood River near Lowman and at Garden Valley
Biological (fish, periphyton and macroinvertebrates)	Fish and macroinvertebrate data for all wadable streams in the watershed

This page intentionally left blank for correct double-sided printing.